CLAIMS

1. A method for selecting the polarization of the laser beam inside a laser cavity, which provides generation of a laser beam (1) inside said resonant laser cavity (20), comprising optical media (8,10,9;9',12;9',14;13;33), which include one or more birefringent optical media (9;12;14;13), characterized in that, said birefringent optical media (9;12;14;13) are used for inducing a double refraction effect on the laser beam (1) and, on the interface (22;32;41,42;51,52;61,62) between said media (9;12;14;13) and a second medium with a different refractive index, separating the propagation directions of the different polarization components (2,3) of the laser beam (1), providing a plurality of resonance directions (6,7) which are distinct for the different polarization components (2, 3), and in that the optical axis of the cavity (20) is selectively aligned on one of said resonance positions (6,7) through the adjustment of the position of one or more optical elements (8,9,10;9',12;9',14;13,33) forming said cavity (20).

2. A method for selecting the polarization of the laser beam inside a laser cavity, according to claim 1, characterized in that said cavity (20) contains an active material (9') with isotropic emission properties.

3. A method for for selecting the polarization of the laser beam inside a laser cavity, according to claim 1, characterized in that said cavity (20) contains an active material (9') with anisotropic emission properties.

4. A method for selecting the polarization of the laser beam inside a laser cavity, according to claim 2 or 3, characterized in that inside said resonant cavity (20) the plurality of resonance positions (6,7) corresponds to a plurality of different optical paths enabling a particular polarization and/or wavelength or other laser property.

5. A method for selecting the polarization of the laser beam inside a laser cavity, according to claim 4, characterized in that it provides for introducing a controlled quantity of losses individually experimented by one or both the polarizations and/or wavelengths in a well delimited path in the laser cavity (20).

6. A method for selecting the polarization of the laser beam inside a laser cavity, according to claim 4, characterized in that said cavity (20) contains a birefringent crystal for producing the separated polarization components.

7. A method for selecting the polarization of the laser beam inside a laser cavity, according to claim 4, characterized in that said cavity (20) contains a

birefringent active laser material for producing the separated polarization components.

8. A method for selecting the polarization of the laser beam inside a laser cavity, according to claim 4, characterized in that said cavity (20) contains a non linear crystal for producing the separated polarization components.

9. A method for selecting the polarization of the laser beam inside a laser cavity, according to claim 4, characterized in that said cavity (20) contains a Q-switching or Mode-Locking optical modulator, whose birefringent active optical element is used for producing the separated polarization components.

10. A method for selecting the polarization of the laser beam inside a laser cavity, according to one or more of the previous claims, characterized in that it uses more than one interface between the birefringent medium and another medium for separating the polarizations.

11. A method for selecting the polarization of the laser beam inside a laser cavity, according to one or more of the previous claims, characterized in that said birefringent optical media in said cavity (20) are a plurality of birefringent elements for separating the polarizations.

12. A method for selecting the polarization of the laser beam inside a laser cavity, according to one or more of the previous claims, characterized in that it provides for selecting the polarization or the resonant wavelength through the alignment of a mirror (10;52) pertaining to the optical media of said resonant cavity (20).

13. A method for selecting the polarization of the laser beam inside a laser cavity, according to one or more of the previous claims, characterized in that it verifies the resonance of a polarization or oscillating wavelength and avoids total extinction of other possible polarizations or wavelengths.

14. A method for selecting the polarization of the laser beam inside a laser cavity, according to one or more of the previous claims, characterized in that it verifies the resonance of a polarization or oscillating wavelength and maintains the simultaneous oscillation of a well controlled fraction of other possible polarizations or wavelengths.

15. A laser system of the type comprising a laser beam (1) generated in a resonant cavity (20), said resonant cavity (20) comprising optical media (8,10,9;9',12;14;13;33), which include one or more optical media (9;12;14;13) with bi-refringence properties, characterized in that said optical

media (9;12;14;13) with bi-refringence properties produce a double refraction for polarized components (2,3) of said beam (1) and multiple resonance conditions (6,7) of the cavity (20), and that said cavity (20) is aligned on one of said resonance directions (6,7) by means of one or more optical elements (8,10,9;9',12;14;13;33) forming it, for selecting a specific polarization component.

16. A laser system according to claim 15, characterized in that said cavity (20) contains a birefringent mirror (14), consisting of birefringent material with non parallel faces, in particular a wedge, with a first face (51) inside the cavity (20) and a second face (52) machined as a mirror, said first face (51) being angled with respect to the second, in a position to operate the separation process of the polarizations, and select them on the desired resonance position (6,7) through the alignment of the mirror itself, or any another optical element (8,10,9;9',12;14;13;33) of the cavity (20).

17. A laser system according to claim 15, characterized in that said cavity contains an active birefringent mirror (9), consisting of birefringent material with non parallel faces, in particular a wedge, with a face (32) placed inside the cavity and a second face (31) machined as a mirror as described above in a position

to operate the separation process of the polarizations, and select them on the desired resonance position (6,7) through the alignment of the mirror itself or any other optical element (8,10,9;9',12; 14;13;33) of the cavity (20), and at the same time provide a laser gain to the cavity (20).

18. A laser system according to claim 15, characterized in that said cavity (20) contains a birefringent device (12,13), consisting of birefringent material with non parallel faces, in particular in the form of a wedge placed inside the cavity (20) as described above, the first face (41,61) being angled with respect to the second (42;62) in a position to operate the separation process of the polarizations, and their selection by means of rotation around one of its own axis or realignment of any other optical element (8,10,9;9',12,14;13;33) of said resonant cavity (20).

19. A laser system according to one of the previous claims, characterized in that the birefringent material is YLF or Nd:YLF or $GdVO_4$ or $YVO_4$ or Nd:$GdVO_4$ or Nd:$YVO_4$.

20. A laser system according to the method of claim 1 and following claims.

21. A discrete element solid state laser resonator, containing an electro-optical Q-switching modulator (33), in which modulation of the loss state of the cavity (20) is

obtained through the combined effect of the electro-optical modulator (33) and selection of the polarization determined according to the method of the claims 1 and following claims, or through the use of one or more devices of the claims 15 and following claims.

22. A discrete element solid state laser resonator, operating in Mode-Locking regime, in which modulation of the loss state of the cavity is obtained with the cooperation of a selection of the polarization and/or wavelength and/or another laser feature determined according to the method of the claims 1 and following claims, or through the use of one or more devices of the claims 15 and following claims.